Elemental Geochemistry of Source-Rocks from the Buxin Formation (Lower Eocene) in the Sanshui Basin, South China

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The Sanshui Basin, located in the middle part of Guangdong Province, South China, is an oil-bearing fault depression with lacustrine sediments of Cretaceous to Paleogene age. The Honggang Member of the Buxin Formation (Lower Eocene) is the main oil source bed of the basin. This work aims at assessing the sedimentary environments of the source rocks based on elemental geochemical data. The distribution of elements (Al, Ti, Fe, Mg, Ca, K, Na, P, Mo, U, V, Ni, Co, Cr, Cu, Zn, Sr, Ba, Cd, Li, Mn and Pb) and elemental ratios serve as proxies for palaeoenvironmental conditions. The Honggang Member can be subdivided into 3 submembers. Elemental concentrations and ratios in Submember A indicate higher terrigenous fluxes with relatively constant chemical composition and low-O2 bottom waters with higher salinity than the other submembers.

Highly saline bottom waters were probably the consequence of intermittent sea water incursions. Submembers B and C, mainly composed of alternating laminated, organic-rich and microbioturbated, organic-lean shales, are characterized by large variations in geochemical features, which reflect rapid fluctuations in palaeoclimate and sedimentary conditions. The laminated shales, deposited during humid intervals, show higher values of elements that are usually enriched in terrestrial detrital minerals and lower concentrations of endogenic elements. Palaeoredox indices suggest anoxic bottom water conditions resulted from a mixture of salinity stratification and thermal stratification, which were favourable for organic matter preservation.

The intervals of dry climate, represented by organic-lean shales, show lower concentrations of terrigenous elements and higher values in endogenic elements with reduced terrestrial input and increased evaporation. Palaeoredox proxies indicate prevailing oxygenated to dysoxic environments developed in bottom waters. Salinity indices for the uppermost part of the Honggang Member show lower values, suggesting that an increasing input of fresh waters caused freshening of the lake waters.